Obstetric anal sphincter ruptures: Risk factors, clinical outcome and prophylaxis

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Abstract

Objective: To review risk factors for obstetric anal sphincter rupture (OASR) and possible preventive strategies as well as clinical outcomes by means of a selected literature review.

Material and Methods: I have based my work primarily on articles recommended by my supervisor Professor Anne Cathrine Staff and by her PhD student, lecturer and senior consultant Katariina Laine. I supplemented with some clinical guidelines, reviews and studies identified by a search of the PubMed database. Search terms included obstetric anal sphincter rupture, obstetric anal sphincter injury, obstetric labor complications, perineum, birth, perineal laceration, birth position, water birth, anal incontinence, hands poised, episiotomy. Additional sources are textbooks and a medical dictionary.

Results: Main risk factors for OASR that are well documented are first vaginal birth, birth weight and vaginal operational delivery. Risk factors with some impact are maternal age, gestational age, prolonged second stage of labor, occipito-posterior presentation, high BMI as well as median episiotomy. Further discussed risk factors are: epidural anesthesia, induction of labor and ethnicity. Obstetric techniques with protective effect include the use of vacuum assisted delivery rather than forceps in operational vaginal deliveries, episiotomy only on indication, episiotomy cut with a rather large angle from the midline, manual protection of the perineum during fetal head crowning and well trained accoucheurs. OASR is a strong risk factor for anal incontinence. As many as 30% to 60% of women with diagnosed and repaired OASR at delivery experience symptoms of anal incontinence in long term follow-up. Additional comorbidities with OASR are urinary incontinence, pelvic floor prolapse symptoms, sexual dysfunction and reduced health-related quality of life.

Conclusions: Obstetric anal sphincter rupture is a complication of vaginal delivery that affects many women due to many vaginal births worldwide. A considerable share of affected patients experience long term health related consequences. Low frequencies of OASR can be achieved by optimizing obstetrical techniques.

Table of Content

1. Introduction

Pelvic floor dysfunction (PDF) is a well known potential complication of pregnancy and vaginal deliveries. Many women having given vaginal birth experience one or several PFDs, such as urinary incontinence, anal incontinence, pelvic organ prolapse, pain and dyspareunia [1]. Anal incontinence is probably the PDF with the greatest impact on women`s lives and wellbeing, leading to discomfort, embarrassment and social withdrawal. Several mechanisms of developing anal incontinence are being discussed. The stress of combined pressure and tissue stretching in the second stage of labor is in various grades leading to damage of the structures in the pelvis due to ischemia, overstretching and finally ruptures. Damage to sacral nerves, overstretching and rupture of the levator ani muscle and injury to the anal sphincter complex are associated with anal incontinence [1]. Overt ruptures of the anal sphincter muscles are probably easiest to identify clinically. It has always been a goal for obstetrician and midwife care to minimize the rates of ruptures. The ways to achieve this have differed through time and are still the object of extensive research worldwide.

In the first years of the 21st century the incidence of obstetric anal sphincter rupture (OASR) came into focus of Norwegian health professionals. The incidence had been rising over the past 30 years in all the major Nordic countries but in Finland, where it was remarkably low in comparison [2]. A study from 1998 indicated that a reason for this contrast might be differences in managing the last stage of a vaginal delivery, as in Finland a traditional delivering technique is still in practice [3]. In 2004 the Norwegian national Health Control Agency investigated data of all the 26 Norwegian delivery wards. [3,4]. The Agency found the incidence to be fourfold with 4,3% in comparison to 1% in 1969. Furthermore they stated that there was room for improvement on registrations and treatment. With this background the Norwegian Department of Health and Social Affairs prompted the national Advisory Committee for Childbirth (Nasjonalt råd for fødselsomsorg) to develop a national plan to reduce the number of OASR and to improve on prevention, treatment and registration [3, 4]. This plan was taken into action in 2006 and major aspects were: reintroducing traditional techniques for the protection of the perineum in the education of midwifes and junior obstetricians, increase the knowledge in midwifes and doctors about preventing and treating OASR by nationwide courses and local educational programs, improving on the quality of OASR registration and using the incidence as a quality indicator in childbirth care as well as stimulation of research on the topic [4]. One of the first studies was carried out at Oestfold Trust Hospital in Eastern Norway to assess if an intensive interventional program can reduce the incidence of OASR [3,4]. The intervention was basically an intensive training of the entire labor ward staff in socalled “Finnish” obstetric techniques that differed from the Norwegian regarding perineal protection. The results were promising with a dramatic drop in OASR frequencies [3]. Consecutive studies displayed similar results [5, 6].

On this background, the scope of this student project evolved: to review risk factors for anal sphincter rupture and possible preventive strategies as well as clinical outcomes.

2. Materials and Methods

Papers and a textbook article were identified by search of the PubMed database. Search terms included obstetric anal sphincter rupture, obstetric anal sphincter injury, obstetric labor complications, perineum, birth, perineal laceration, birth position, water birth, anal incontinence, hands poised, episiotomy. My selected reading is partly a result of this own conducted search, but mainly the result of the recommendation from my supervisor of this student review (Professor Anne Cathrine Staff) and from her PhD student, lecturer and senior consultant Katariina Laine, the latter with an excellent overview over the literature due to her own research on preventing OASR (obstetrical sphincter ruptures). In addition, I will also refer to the "Perineum study", an ongoing research project at Oslo University Hospital, Ullevål, in form of published results from this study (conducted by MD/PhD student Kathrine Fodstad, supervised by Staff and Laine). Further literature sources have been clinical guidelines, textbooks and a medical dictionary.

I have based my work primarily on the recommended articles, secondary on reviews and guidelines and finally supplemented with some additional studies.

3. Results

3.1 Definitions

Obstetric anal sphincter ruptures are injuries of the anal sphincter complex acquired during delivery. The injuries may include the anal/rectal mucosa. They are classified as perineal tears grade three or four [7, 8] (see classification below).

The perineum is defined as the region between the pubic symphysis, the ischial tuberosities and the coccyx (regio perinealis) and in a less broaden sense as the area between the anus and the vaginal fouchette [9].

Classification of perineal tears [7, 8]

Grade 1: superficial injury of perineal skin or vaginal mucosa
Grade 2: deep injury in the perineum affecting perineal muscles but not the anal sphincter
Grade 3: injuries to the perineum involving the anal sphincter:
- 3a: disruption of < 50% thickness of the external anal sphincter (EAS)
- 3b: disruption of > 50% thickness of the external anal sphincter
- 3c: disruption of EAS and internal anal sphincter (IAS)

Grade 4: injury of the perineum involving the anal sphincter and anal/rectal mucosa

Isolated ruptures of the internal anal sphincter, the anal or rectal mucosa are not separately classified.

3.2 Incidence of obstetric anal sphincter rupture

Incidences of anal sphincter tears vary greatly among locations and over time. While the incidence in Norway in the late 1960´s was under 1%, it rose to over 4% in 2004 [3, 5]. This difference is unlikely to be explained by better diagnostics of tears over time, neither do changes in traditional maternal or fetal risk factors account for the changes [10]. This augmenting incidence was parallel in Denmark and Sweden, but not in Finland, where the incidence rose from under 0.5 % to approx. 1% in 2006 [3].

Some more examples from other countries or single institutions to illustrate the range of OASR rates:
Germany 2005: 1,63%, 2008: 1,4% [11].
An Italian birth center 2006: 0,4% [12].
A North-American delivery center up to 28% in the late 20century [1].
Most current papers are reporting incidences between 0,5 – 10% [13, 14].

3.3 Risk factors for OASRs

3.3.1 Maternal

The dominant maternal risk factor for OASR is the first vaginal birth, compared to following deliveries. This is well documented in the literature [3, 10, 12, 13]. Baghestan et al [10] conducted a population based cohort study on data from the Norwegian Medical Birth Registry between 1967 and 2004, enrolling 1,673,442 vaginal births. They reported an adjusted Odds Ratio of 4,8 (4,7-5,0) for the first compared to second vaginal birth. This OASR risk was even higher, when the first vaginal birth was preceded by a cesarean section. The Odds ratio for the third vaginal delivery was 0,5 compared to the second, declining further with 0,1 per consecutive delivery.

Women who have had an injury to their anal sphincter at a previous delivery, are at a seven to ten fold risk for obtaining an recurrent OASR than women without a history of previous sphincter trauma [13, 14].

A high body mass index is correlated to heavier babies, a greater risk of instrumental deliveries and of perineal laceration and therefore resulting in higher frequencies of anal sphincter ruptures [14].

Other maternal factors that slightly increase the probability of OASR mentioned in the literature are: maternal age, gestational age, gestational diabetes and diabetes type I, but not type II [10, 4, 14].

Results for ethnicity are incoherent. Baghestan et al. [10] found association with African or Asian origin of the mother when giving birth in Norway. Fitzgerald et al [15] reported in a small study higher OASR frequencies in Caucasian women compared to African-American or Hispanic women, while Wheeler et al [16] found that Asian compared to Caucasian ethnicity is a risk factor for OASR in Western countries, but not in Asia. Dudding et al [14] relates the relative risk of OASR for women of Asian ethnicity to their relative short stature.

3.3.2 Fetal

Birth weight is a well documented risk factor for OASR [10, 14, 16]. Bagesthan et al [10] calculated adjusted odds ratio for birth weight ranging from less than 2500g to more than 5000g in 500g steps. For every step the odds ratio rose with increasing differences from 0,2 to 5,9. In the same study head circumference was reported to be a risk factor for OASR as well. This finding persisted when odds ratios for head circumference were additionally adjusted for birth weight, making macrosomia the most important fetal risk factor.

A persisting occipito-posterior presentation of the infant is related to higher frequencies of anal sphincter injuries, even when adjusted for instrumental assisted delivery [14].

3.3.3 Obstetric

Instrumental assisted vaginal deliveries have been proven by several studies to impose a powerful risk for obtaining high order perineal lacerations [10, 14, 16]. Baghstan et al [10] report an adjusted odds ratio for OASR of 3,9 for forceps deliveries and 2,0 for vacuum deliveries. The trend of a double OASR rate in forceps use compared to vacuum is reflected in the literature [14, 16].

The effect of episiotomies in reducing OASR rates is controversial. The technique was introduced with the intention to protect maternal and fetal health by shortening the length of second stage, thus reducing maternal exhaustion and blood loss, protecting the pelvic floor and decreasing the rates of damages to the infants [17]. Episiotomy is "defined as a surgical enlargement of the vaginal orifice by an incision of the perineum during the last part of the second stage of delivery" [18].

Using episiotomies literally became a "kick off" at a gynecological congress in 1920, when DeLee promoted mediolateral episiotomy in first deliveries with the arguments presented above. Within the early 20Century the practice of routine episiotomy became increasingly widespread [17].

From the 1980s there were increasing discussions of the advantages and consequences of episiotomies. Results point into the direction that episiotomy does not globally protect the pelvic floor or improves neonatal outcome, but might actually increase maternal blood loss, post partum pain and dyspareunia [17]. This lead to trials showing that restrictive use of perineal cuts on clinical indication might be the best alternative [17]. While there is consensus in Europe that midline episiotomy is a well proven risk factor for severe perineal laceration, the role of mediolateral and lateral episiotomy is still controversial [14,17]. Recent research is pointing to a protective effect of lateral episiotomy on indication (see section 3.4.2.).

A survey conducted among 122 European hospitals in 2006 revealed that definition of mediolateral episiotomy differs widely among doctors and midwifes [19] and studies measuring the angle and length actually cut confirm this [20, 21]. Therefore, the literature on types of episiotomies performed (or believed to have been performed) may not always assess a true evaluation of the association between episiotomy and OASR.

Further obstetric risk factors mentioned in the literature are prolonged second stage of labor [7, 8, 10, 14], induction of labor by prostaglandin [14, 22], epidural anesthesia [10, 12, 13], fundal pressure [4, 14, 22], fast expulsion of the infant's head and shoulders [4, 22], stimulation of labor [4], and birth attendant`s inexperience [2]. Experience and the obstetric technique chosen seem to have a

considerable impact. The person assisting during the delivery (named accoucheur) may even overrule birth weight as a risk factor for OASR [2].

The "hands off technique" (where the accoucheur does not actively protect the perineum during second stage of labour) is discussed and controversial as a risk factor for OASR (see 3.4.3).

3.4 Preventing obstetric anal sphincter ruptures

Many of the risk factors for OASR are beyond the influence of the accoucheur. Almost 50% of all deliveries in Norway are by primiparous women, macrosomia is encountered more often and the median maternal age is increasing [10]. But the knowledge of risk factors for OASR might help the accoucheur to identify women that might need additional preventive measures.

Finland has the lowest incidence of OASR when compared to the other three Nordic countries Denmark, Sweden and Norway as mentioned before. But whereas demographic factors do not differ between the Finnish population and the other Nordic countries, obstetritic practice does. Some of those differences are [2]:

- Continuous use of the traditional way of protecting the perineum
- Markedly higher use of episiotomy
- Lateral contra mediolateral episiotomy technique

Similarities are [2, 10, 26]:

- restrictive use of episiotomy on indication
- ventouse delivery incidence
- incidence of cesarean section

Three interventional studies conducted in Norway demonstrated that it is well possible to reduce the incidence of obstetric anal sphincter tears dramatically from ca 4% to ca 2% in the course of few years [3, 5, 6]. No changes in maternal or fetal risk factors could account for the drop in incidence, leaving the causalities to obstetric risk factors. For this reason I will look more closely at the interventional measures. The cornerstones of the interventional programs were:

- information to the labor ward staff about anal sphincter rupture
- an extensive training program to educate both midwifes and physicians in a manual perineal supporting technique
- focusing on clinical indications for episiotomy as well as a lateral technique

Further aspects that were of importance were aiming at a good communication between the accoucheur and the mother. Encouraging mothers to move freely during labor and adopt any position comfortable for her and helping her to find a position that suits her but allows good visualization of the perineum during the final part of second stage.

These particular obstetric methods are explored more in detail subsequently.

3.4.1 Vacuum assisted vs forceps assisted deliveries

Vacuum assisted extraction is associated with a significant lower risk of OASR (see 3.3.3.) Neither the Norwegian obstetric guidelines nor the guidelines of the Royal College for Obstetricians and Gynecologists do give a recommendation on whether to prefer vacuum or forceps at operative vaginal deliveries [23, 24]. The reason for this is that vacuum extraction compared with forceps is more likely

to fail delivery [14], and is associated with a higher incidence of cephalhaematoma and retinal haemorrhage [7]. Furthermore are vacuum instruments not recommended for preterm infants, because of the risk of subgaleal and intracranial haemorrhage and they are contraindicated with face presentation [7]. For those reasons the clinician must decide which instrument might serve best according to the clinical indications and his or her skills [23, 24]. Nevertheless birth registry data from Norway show that vacuum is applied clearly more often than forceps in operational vaginal deliveries [10].

3.4.2 Episiotomi

As mentioned above (in section 3.3.3), recent research is proposing that lateral episiotomy actually might be protective for the anal sphincter complex. "The lateral episiotomy technique is defined as an incision commencing 1-2 cm lateral to the posterior fourchette, directed towards the ischial tuberosity" [18]. Eogan et al [25] calculated with logistic regression analysis a reduction of 10% relative risk for every degree a mediolateral episiotomy was cut further away from the midline.

Räisänen et al [26, 27] have evaluated data from the Finnish Medical Birth Register for the period of 1997 – 2007 in regard to several aspects concerning episiotomy, including 500 000 and 400 000 women in two studies. In Finland lateral episiotomy is the standard episiotomy technique. The studies indicated that lateral episiotomy may have had a protective effect against OASR in primiparous women. While 909 episiotomies were needed in the primiparous population to prevent one OASR, the "number needed to treat" was reduced to 66 when applied to vacuum assisted deliveries in primiparous women. Therefore routine episiotomy might be rather beneficial on the indication of instrumental deliveries. Multiparous women had a 2,4 fold higher incidence of OASR when treated with episiotomy. According to the authors this might not be causal, but rather confounded by the indication.

Besides instrumental vaginal delivery, further indications for episiotomy in the intention to prevent a major perineal injury are fetal distress and threatening perineal rupture [6].

British obstetrical guidelines recommend a mediolateral technique with careful attention to the angle (being large enough) cut away from the midline [7]. National Norwegian guidelines do presently not comment on recommended episiotomy technique [8], while the local guideline for Oslo Universitetsykehus Ullevål recommends lateral episiotomy cut 4 – 5 o`clock [22].

3.4.3 Hands poised versus manual protection of the perineum

There are few randomized controlled trials that meet the quality criteria for inclusion in reviews. The couple of studies that are included present results pointing in contrary directions, prompting guidelines to recommend practice ad libitum [28, 29, 30].

The three previously mentioned Norwegian interventional studies, reintroducing the manual technique for perineal protection, do clearly point into the direction that this method is preventing a pronounced share of OASR from happening. The purpose of the technique is to control the pace of head crowning as this may give the tissue more time to stretch and to guide the infants head through the introitus in a manner that reduces the potential pressure on the sphincter apparatus and perineal tissue.

The technique is described as follows [2, 5]:

The mother is helped to find a position that allows good visualization of the perineum by the accoucheur, for example lithotomy. When she is in this position and the accoucheur is standing at her right side:

- the accoucheurs left hand is kept on the neonate's back head, applying slight pressure to prevent it from fast crowning
- the right hand supports the perineum by trying to collect tissue around the perineal body between thumb and index finger
- in addition the right middle finger is trying to gripe the neonates chin to guide the head upwards through the introitus

Complementary to the manual technique the mother is encouraged at this phase to restrain from pushing.

3.4.4 Birth position of the delivering woman

A review article concludes that upright delivery positions in general may lead to a shorter duration of the first and second stage of labor, less need for obstetric intervention, less pain and increased satisfaction but increased blood loss [30]. On perineal outcome the results are more diverse. Trends that might be deduced are: positions that are more often found to lead to severe perineal trauma are squatting, birth stool, semi-recumbent and lithotomy, but the latter only in relation to instrumental birth. Positions mentioned with less frequent major perineal trauma are lateral and on all fours [28, 31, 32], but large randomized controlled trials are lacking.

3.4.5 Other measurements reflected in the literature

Dahlen et al [32] enrolled 6144 women in a study at a birth center comparing waterbirth to land delivery and different birth positions. They compared minor perineal trauma (1^{st} degree tear) to major perineal trauma (2^{nd}, 3^{rd}, 4^{th} and episiotomy). They found a tendency of more frequent major perineal trauma in land birth, but only the position in the birth stool had a significantly higher rate. In a systematic review including 11 RCTs and 3146 women, there was a tendency of applying fewer episiotomies in water, but perineal tears of grade 2 -4 occurred more often. None of these results were statistically significant and birth position was not accounted for [28].

There is slight evidence that continuous support during labor might reduce the rate of assisted vaginal birth, thus possibly leading to a better perineal outcome. However there was no difference in the percentage of women with overall perineal laceration, including episiotomies [28].

Results from studies comparing passive vs active descent or exhalatory vs sustained (valsalva) bearing down during delivery show no significant differences and are underpowered [28, 33].

Antenatal perineal massage is reported to reduce the number of episiotomies in primipara, but made no significant difference in perineal tears of all grades [34]. Conclusions regarding perineal massage intrapartum are contradictionary, while NICE guidelines from 2007 discourage from applying it, a review conducted in 2011 found significant positive effect on the perineum, but does not specify it in concern to grade of tear [30]. To studies referred to in the same review found significant reduction of grade three and four tears by applying warm compresses against the perineum intrapartum [30].

3.5 Treatment of Anal sphincter Rupture and outcome

3.5.1 Treatment

Most recommendations are based on clinical experience, but there is high level evidence that end-to-end as well as overlap repair technique for the external anal sphincter have equal outcome [7].

It is of utmost importance to identify OASR immediately postpartum to carry out primary repair and adequate additional therapy. Primary repair has a better outcome than secondary repair, and pain, discomfort and fistulas can be prevented [1, 35]. A nationwide study of obstetric claims for compensations in Norway revealed that the most common reason for claims and compensation where asphyxia, shoulder dystocia and anal sphincter tears that were not diagnosed at delivery [36], demonstrating the severity overlooked OASR may have on women`s lives.

It is recommended in British and Norwegian guidelines [7, 8] that every woman with suspicion of genital trauma after delivery is to be examined thoroughly. When she was delivered operatively or has a perineal trauma, this clinical gynecological examination should be done by a trained clinician with experience in diagnosing and treating OASRs. When an OASR is diagnosed, the repair should be done at an operational theater with general or local anesthesia. Good anesthesia is crucial for the sphincter muscles to relax [7], and thereby to obtain better muscle repair. A trained clinician must be present either operating or assisting. Overlap or end-to-end technique may be used as there is no evidence favoring one over the other [7].

Postoperative management of a repaired OASR include [7, 8] following recommendations in the UK and Norway:

- broad-spectrum antibiotics covering anaerobe and aerobe bacteria to prevent infection and poor wound healing (grade four in Norway, grade three and four in the UK)
- postoperative laxantives to avoid wound dehiscence
- a conversation with the woman postpartum about her injury including information about the grade of tear, follow-up routines, prognosis and where to seek help if symptoms develop
- the offer for physiotherapy and pelvic floor exercises, starting 6-12 weeks postpartum
- a follow-up by a consultant obstetrician and gynecologist within one year with referral to specialist on this field when the patient is symptomatic

3.5.2 Outcome of primary and secondary anal sphincter repair

The main complication of OASR is anal incontinence, which is the unintended leakage of stool (fecal incontinence) and/or gas (flatal incontinence) [16]. Obstetric sphincter tear is the only risk factor that is strongly associated with anal incontinence, grade four being even more clearly associated than grade three [37, 39].

Different scoring systems to assess anal incontinence are in clinical use, the two referred to most frequently are the Wexner incontinence score questionnaire and the St. Marks incontinence score. In addition, authors use different thresholds when symptoms qualify for anal incontinence, for example symptoms occurring once a week vs once a month [35, 38]. Also the time of symptom assessment plays a role. There is a slight improvement of AI symptoms during the first year postpartum after a OASR episode, but a slow deterioration in the long term, when other factors as age, multiple

deliveries, progressive neuropathy and menopause contribute to aggravate symptoms [37]. Social and psychological factors may further influence how women report on their symptoms, not to mention the embarrassment even in a professional setting. This is reflected in the poor correlation between diagnostic examinations and reported symptoms [37].

According to the British Royal College of Obstetricians and Gynecologists, the prognosis of OASR with primary repair is fairly good, with 60% to 80 % being asymptomatic at 12 months [7]. But even when obstetric sphincter ruptures are identified and repaired immediately, cohorts of women having gone through it, report markedly more often symptoms of anal incontinence, than women without diagnosed OASR [35, 39]. While short-term results of primary repair can be satisfactory in over 90% of patients, as many as 30% to 60% experience symptoms of anal incontinence in long-term follow-up studies, in spite of adequate treatment [1, 14, 39]. The results for secondary repair are not reassuring as well. While 70% are continent after 12 months, only 50% and 20% remain continent after respectively 5 and 10 years [14].

In addition to anal incontinence, women with OASR have a higher probability to suffer from urinary incontinence [35, 39], pelvic floor prolapse symptoms [35], sexual dysfunction [40], and are shown to have reduced health related quality of life [41].

3.5.3 Treatment for anal incontinence

There are several treatment options for patients that present with anal incontinence. I will refer here some methods that are summarized in the review by Dudding et al from 2008 [14].

Drug therapy: antidiarrheal drugs are effective for a recognizable proportion of patients. Loperamide was in this review considered to be the drug of first choice. Alternatives were Codeine phosphate and the tricyclic antidepressant Amitriptyline, but both drugs have considerable side effects.

Biofeedback training is also helping many patients. It comprises information to the patients about incontinence, sphincter exercises, rectal sensory training as well as training to react to rectal distension with voluntary EAS contraction. However, improvement of continence with this technique seems to be inversely related to the size of EAS injury.

Sphincter repair: I have commented on the effect of primary and secondary sphincter repair above.

Sacral Nerve Stimulation: Although it is a method primarily for patients with intact sphincters, two small trials report promising results for patients with sphincter disruption. After a test period of stimulation, a permanent neurostimulator is implanted. The procedure can be done with local anesthesia and does not spoil for later sphincter repair if needed.

Colostomy and Neosphincter procedures are further options for patients with severe anal incontinence in whom other treatments have failed.

4. Discussion

4.1 Incidence

Differences in the incidence of OASR between countries and hospitals and changes in the incidence of OASR over the last three decades in the three Nordic countries seem not to be explainable by differences in maternal or fetal risk factors. The remaining causes are different obstetric practice and human factors such as different registration routines or better competence in diagnostics [3]. Luthander et al [35] refer to studies showing an increase in incidence when women are examined by an experienced clinician. This is taken account for by the recommendation in obstetric guidelines that all women with major perineal tear are to be examined by a senior obstetrician [7, 8]. On the other hand the same authors mention the possibility that when OASR comes into focus as an indicator for clinical excellence, it might be a disincentive to report cases. Even if those human factors probably play a role in every delivery ward and are difficult to assess, it is hard to imagine them playing a main part as it would mean professionals underreporting tremendous parts of serious complications such as OASRs. Therefore I follow the reasoning of those authors accounting differences and changes in OAST incidence to alterations in obstetric delivering techniques.

4.2 Risk factors

There is consensus in the literature when it comes to three major risk factors for OASR. These include first vaginal births, macrosomia and instrumental deliveries, especially forceps assisted deliveries.

A number of other risk factors are additionally identified. They have a lower impact than the above, but study results are seldom contradictory. Those factors are occipito-posterior presentation, median episiotomy, routine episiotomy, previous OASR, previous cesarean delivery, maternal age, gestational age, prolonged second stage of labor, induction of labor as well as a high BMI.

In addition there are risk factors that are either seldom mentioned or are more uncertain such as epidural anesthesia, stimulation of labor, fundal pressure, ethnicity, birth position of the mother and experience of the birth attendant.

Although all those risk factors have been identified, it is not possible yet to predict which woman is going to suffer an obstetric anal sphincter rupture [14]. For example, even if a large baby (macrosomia) is a risk factor for OASR, the majority of OASRs happen in deliveries of a normal-sized baby. It seems to me that the causes leading to an OASR are multifactorial. Factors may not always be positively correlated. While one factor might be protective in a particular setting, it might still be a risk factor in another. Mediolateral episiotomy is demonstrating this. Furthermore there might still be risk factors confounding which are to be explored yet, such as connective tissue properties of the women giving birth [14] or other hereditary characteristics.

4.3 Prevention

When a risk factor for an event is identified, prevention can be achieved by avoiding these factors. Unfortunately most of the risk factors for OASR that have been identified so far can only be recognized, but hardly affected. There is little to do with a mother`s high BMI in the labor ward, or with clinical indications that call for instrumental vaginal delivery or induction of labor. Obstetrical methods, such as management in the second stage of labor have been less studied and results are often inconclusive. Some of the methods and factors coming into focus besides episiotomy are: birth position of the mother, the valsalva maneuver, manual protection of the perineum, breathing technique

of the mother during fetal head crowning, continuous midwife support for the mother and expertise of the accoucheur.

Episiotomy is currently being investigated in relation to OASR. Earlier studies came to contradictory results. Possibly due to variations in definitions and techniques between countries and clinics [19-21]. Taking this into consideration a group of European researchers propose that a standard of defining episiotomy and its classification should be introduced [45], making the results comparable. Nevertheless, most authors agree that routine episiotomy is not indicated, but it is still uncertain as to the the optimal frequency of this operation within a standard patient population. The advantages of a more lateral episiotomy may be the greater distance to the sphincter ani musculature than the more traditionally used mediolateral technique. Traditional reasons as to why a median episiotomy might be chosen include the belief that the lateral technique implied more pain and more bleeding than mediolateral technique. These assumptions were however not confirmed in a study at Oslo University Hospital by Fodstad et al [18] In this study, there was no difference in bleeding and in pain the first day postpartum between women with different types of episiotomies. This study was however too small to assess the risk for OASR

The three interventional studies conducted in Norway, reintroducing the manual technique for perineal protection, showed a dramatic fall in the incidence of OASR. The intuitive conclusion would be that this method might be the preferred in order to lower the risk for patients undergoing a OASR complication. However, several techniques were combined in these interventions (see above 3.3.3) and it might therefore be difficult to distinguish the impact of any single factor. Close monitoring of the perineum when applying the manual protection may nevertheless also facilitate a conclusion of whether episiotomy is indicated or not. During the intervention period, the rate of episiotomy remained the same in three of the interventional hospitals, while the incidence of OASR fell significantly in all same hospitals [5, 6]. This may lead to the conclusion that the technique of episiotomy had a greater impact on OASR frequency than the frequency of episiotomy use.

Randomized controlled trials (RCTs) could be appropriate to differentiate between the single aspects of the intervention. The authors of the abovementioned Norwegian intervention trials considered it not to be ethical to enroll women in a randomized trial to test their hypothesis [3, 5]. With the dramatic fall in OASR rates after the interventions at the respective hospitals, it does not seem ethically correct to leave out one or more aspects of the described interventional package to test the relevance of each clinical step. An important aspect of this argumentation is that the proposed intervention package does not imply any harm to the delivering mother. Specifically, the intervention program at Oslo University Hospital has not resulted in more episiotomies in women delivered spontaneously vaginally, only more episiotomies in the high risk group of vaginally operatively delivered women [3, 5].

In addition, one may question the applicability of RCTs for research on intrapartum procedures. Accoucheurs naturally wish to do the best for the women in labor/ giving child birth. I assume they want to do their best to ease the women in such a vulnerable situation and should be free to use the technique they believe is best according to their knowledge. I find it hard to imagine them switching between methods according to the randomization protocol. Even if they do, they might still have their opinions, thus influencing the outcome even if the outcome evaluation should be blinded. Maybe observational studies, exploring one aspect at a time might bring further knowledge in the future.

Some additional thoughts about birth position and waterbirth: In an all-fours position of the delivering woman, the weight of the infants head rests upon the symphysis and relieves thus possibly pressure on the perineal body, as in contrast to lithotomy where it presses on the perineal body. This might have a protective impact on major perineal trauma. The same mechanism, relieving some pressure on the

perineal body, might be assumed for the lateral position. However both positions might impair visual control of the perinenem.

The results regarding the impact of waterbirth on perineal lacerations have been inconclusive. It seems that other aspects are of more importance and there is likely a large selection bias as to which women choose to deliver in water. It is possible that immersion in water could have a positive effect, similar to the effect of warm compresses. On the other hand, is it more difficult to visualize the perineum when the woman is in water. Therefore, women at a higher risk for OASR, such as a predicted large baby, small stature, high age, first birth and previous c-section might profit from giving birth on land.

4.4 Outcome

The proportions of patients that suffer from anal incontinence after OASR vary between follow-up studies. Anal incontinence includes the unintended leakage of stool (fecal incontinence) and/or gas (flatal incontinence) [16], but there is no consensus on how often this has to happen in order to qualify for the diagnosis of AI. In addition, the time for follow-up varies from 6 weeks to several years in these studies. Nevertheless there is one clear trend: patients diagnosed with OASR at delivery suffer clearly more often from AI and other comorbidities than controls (without OASR). A review on ultrasound diagnosed obstetric anal sphincter injury in postpartum women showed a prevalence of occult sphincter ruptures to be as high as 30% among primipara, with none of them having a rupture prior delivery [43]. An occult anal sphincter injury is hardly detectable on routine clinical examination [43]. Endoanal ultrasound scan (EAUS) is currently the most accurate way to clinically evaluate obstetric damage in the anal sphincter [37, 43]. Persistent sphincter defects after OASR, detected with ultrasound, is strongly associated with AI [37]. There may be numerous women, having undergone an "occult OASR" and not routinely followed up postpartum, that are living with AI, but not seeking professional help.

In addition to those women that suffer from occult OASR, there will probably be some missed cases of overt OASR. In order to identify all cases of OASR, EAUS seems to be a superior technique. But it is presently not an option to screen every women postpartum and maybe not acceptable to every women either [14]. But maybe it is worth considering those patients where OASR is already suspected. Immediately postpartum transperineal ultrasound may yield comparable results and is probably more acceptable to patients [14]. In order to break down the tabu around AI and to identify as many women with AI symptoms due to delivery, I propose that every woman post partum is informed that

- her pelvic floor might have taken damage
- much of the damage is going to heal in the following months
- she might experience UI, AI, POP, pain, dyspareunia
- those are common symptoms and there is professional help to get

followed by written information including a scoring system for self-assessment and when and where to seek help, if necessary.

5. Conclusion

Obstetric anal sphincter ruptures are a common complication of delivery. Adequate repair and treatment is not able to restore full anal sphincter function in all patients. There are several maternal

and fetal risk factors that cannot be altered. Three interventional studies in Norway, where some aspects of obstetric practice were changed and incidences in OASR were reduced dramatically, demonstrate that a considerable share of this complication indeed is preventable.

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